Cobleigh 421, 523, 523A, 524, 525, 525A
Barnard 107

Chemical Hygiene Plan

Montana State University
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Completed by: Andrew Lingley

OVERVIEW

The Occupational Exposure to Hazardous Chemicals in Laboratories standard (often known as the Laboratory Right to Know Standard or simply the Laboratory Standard) is found at 29 CFR 1910.1450 and is adopted into the Montana Administrative Rules, (ARM 24.30.102(5) 1910.1350). The ARM requires a written Chemical Hygiene Plan (CHP). This document will serve as the CHP for Cobleigh 523, 523A, 524, 525, and 525A, and for Barnard 107 and 114.

The Chemical Hygiene Plan consists of the following elements:

- ➢ Purpose
- ➢ Standard operating procedures
- ➢ Criteria for control measures
- ➢ Fume hoods and other protective equipment
- ➢ Employee information and training
- ➢ Prior approval circumstances
- ➢ Medical consultation and medical examinations
- ➢ Designation of responsible personnel
- ➢ Employee protection provisions for particularly hazardous substances

Andrew Lingley has overall responsibility for this CHP and will be designated as the Chemical Hygiene Officer, CHO for the above listed lab/labs. The CHO and laboratory staff will review and update the plan, as necessary. Copies of the CHP may be obtained from the corresponding CHO.

PURPOSE

The implementation of this CHP provides employees with the information and training necessary to improve workplace safety and health and to prevent chemical-related injuries and illnesses in our facilities. It provides greater worker protection to protect our employees, our most valuable asset. This plan is a complete and thorough documentation of our laboratory right to know program and of the methods, practices, and information necessary to protect employees from the hazards of the chemicals in use in this facility.

STANDARD OPERATING PROCEDURES

Uniformity of practice in the laboratory ensures safety and efficiency. These Standard Operating Procedures (SOPs) create a standard of practice that is to be followed by all employees working in the laboratories at this facility, to ensure the safety of its employees.

General Principles

1. Know the safety policies and procedures that are applicable to the task.
2. Determine the potential physical, chemical and biological hazards and appropriate safety precautions before beginning any new or modified procedure.
3. Know the location of all emergency equipment in the laboratory and the proper procedure for each device.
4. Be familiar with all laboratory emergency procedures.
5. Be alert to unsafe conditions and actions, and alert the Chemical Hygiene Officer.
6. Follow acceptable waste disposal procedures to avoid hazards to the environment.
7. Ensure that all chemicals are correctly and clearly labeled.

8. Post warnings when unusual hazards exist, such as flammable materials or biological hazards.
9. Avoid distracting or startling a coworker.
10. Use equipment only for its originally designed purpose.
11. Do not work alone in the laboratory if any hazardous procedures are being conducted.
12. Do not store, handle, or consume food in the laboratory.
13. Never use glassware or utensils that have been used in the laboratory to store, prepare, or consume food or beverages.
14. Report unusual odors as soon as they are detected to the Chemical Hygiene Officer.
15. Do not use odors as a means of determining that inhalation exposure has or has not been exceeded. Whenever there is a reason to suspect that a toxic chemical inhalation limit might be exceeded, whether or not a suspicious odor is identified, notify the Laboratory Supervisor or PI.
16. Use safety glasses at all times (except when using microscopes) and a face mask when pouring chemicals used in acid and base benches.
17. Use careful handling and storage procedures to prevent damage to glassware.
18. Do not use damaged glassware items, discard or repair the item.
19. Broken glassware must not be handled directly by hand, but must be removed by mechanical means such as a brush and dustpan, tongs, or forceps.
20. Report all accidents immediately to the Chemical Hygiene Officer. An accident report must be completed for every accident, major chemical spill or fire.

Guidelines for General Personal Hygiene in the Laboratory Setting

1. Chemicals should not touch your skin, because you should have gloves and PPE in place when working with chemicals. If a chemical does touch your skin, wash promptly.
    a. Use lots of water; do not wash with solvents.
    b. Wash thoroughly immediately after leaving laboratory.
2. Do not eat, drink, or apply cosmetics in the laboratory. No tobacco allowed in labs.
3. Food and drinks shall not be stored in laboratory refrigerators.
4. Use suction bulbs for pipetting; do not use mouth suction.
5. Do not sniff chemicals. Avoid inhaling toxic vapors and gasses; use fume hoods when directed to by product material safety data sheets (SDS).

Guidelines for Handling and Use of Flammable Chemicals

1. Chemicals with flash points below 200 degrees Fahrenheit are considered “fire hazard” chemicals.
2. These chemicals must be stored in approved flammable solvents cabinets.
3. Fire hazard chemical usage should be conducted under vented hoods and away from sources of ignition.
4. When transferring fire hazard liquids between conductive containers, provide bonding (through metal to metal contact or bonding wire) to prevent ignition via static discharge. If you require assistance regarding grounding through metal to metal contact or use of bonding wire please contact the MSU Hazardous Materials Manager in Safety and Risk Management.

Guidelines for Handling and Use of Corrosives/Caustics, and Contact-Hazard Chemicals

1. Chemicals that can cause destruction of or irreversible alterations in living tissue by chemical action at the site of contact; or having a pH less than or equal to (≤) 2 or greater than or equal to (≥) 12.5 will be considered corrosives/caustic and contact hazard

chemicals.
2. Handle these chemicals with proper safety equipment, including safety goggles or shields, gloves resistant to permeation, and a lab coat or protective apron.
3. Do not store corrosives or contact hazard chemicals near incompatible substances. Acids and bases should be stored separately.

Guidelines for the Handling and Use of Reactive Chemicals

1. Chemicals that are capable of detonation, explosive reaction, or are either oxidizers or organic peroxides will be considered reactive chemicals.
2. Isolate reactive chemicals in storage areas. Reactive chemicals should always be stored according to SDS recommendations.
3. Design reaction experiments with safety barriers or shields (such as lowering fume hood sash), as well as with controls for heating and stirring outside the shielded area.
4. Use and store the minimum amounts of chemicals required by the experiment.
5. Perform experiments involving the use or heating of perchloric acid in perchloric acid hoods.

CRITERIA FOR CONTROL MEASURES

As part of the CHP, criteria have been developed for determining and implementing control measures to reduce employee exposure to hazardous chemicals in the laboratory. The criteria may be based on the degree of toxicity of the substances to be used, the exposure potential of the chemical procedures to be performed, the capacity of the engineering controls, administrative practices or protective equipment to control employee exposure effectively. These measures are specified in the manufacturer provided SDS for all applicable chemicals. Additional requirements to be included in the CHP where appropriate to protect employees working with particularly hazardous chemicals such as select carcinogens, reproductive toxins and chemicals exhibiting a high degree of acute toxicity include:

Standard control measures in use in our facility include, but are not limited to:

- No eating or drinking will be allowed in the laboratory or chemical/hazardous material storage areas of the building.
- All work will be conducted in a manner to minimize potential exposure to hazardous materials which will include: Monitoring of building engineering controls to ensure that fume hoods, exhaust systems and emergency controls are in working order.

Engineering control measures in use in our facility include, but are not limited to:

- General ventilation
- Fume hoods
- Approved flammable chemical storage cabinets
- Chemical secondary containment

Work practice control measures in use in our facility include, but are not limited to:

- Separation of incompatible chemicals
- Performing hazardous work within fume hood(s) to minimize potential exposures to hazardous chemicals
- Required use of hazard appropriate personal protective equipment (PPE)
- Required use of proper chemical secondary containment

• Prohibition of mouth pipetting
• Prohibition of eating and drinking within all lab areas

Personal protective equipment (PPE) in use in our facility includes, but is not limited to:

Gloves

Glove selection is based upon chemical hazard type and glove material compatibility considerations with regard to chemical(s) of interest. Gloves are one of the most common forms of protective clothing. When properly selected, gloves can offer protection from exposure to a wide variety of hazardous and infectious substances. If there are any questions concerning the proper type of glove materials or proper use of gloves, the Laboratory Supervisor or PI should be contacted.

a. Thermally Resistant Gloves

Thermally resistant gloves are used when handling exceptionally hot or cold materials. Although asbestos gloves are no longer used because of the carcinogenic hazard they present, substitute materials exist. Before each use, gloves should be inspected for punctures and tears and replaced, if necessary.

b. Chemically Resistant Gloves

Chemically resistant gloves should be worn whenever potential contact exists between the skin and corrosive or toxic materials. Neoprene, polyvinyl chloride, nitrile, and butyl or natural rubbers are the most common glove materials.

Before each use, all gloves should be inspected for discoloration, punctures, and tears. Before removal of any gloves, the user should wash the gloves appropriately. Gloves should be removed before leaving the laboratory and prior to touching doorknobs, telephones, pens or pencils, notebooks, etc. As gloves are eventually permeated by chemicals, they can only be used for limited time periods.

Non-disposable gloves should be inspected carefully before each reuse. Gloves should be replaced periodically, depending on the frequency of use and the permeability to the hazardous materials handled. When possible, disposable gloves should be used. If there are any questions concerning the proper type of glove materials or proper use of gloves, the CHO, PI or Laboratory Supervisor should be contacted.

c. Gloves for Biological Work

Nitrile or vinyl gloves are marketed as sterile or non-sterile. Latex gloves are not recommended for use with some biological agents and toxins. Generally, the non- sterile type is suitable for most biological work. Sterile gloves can be used for microbiological work in which there is a chance the gloves may contribute to contamination. When working with human pathogens or blood, double gloving is highly recommended. Single-use disposable gloves should be used for general biological work. Gloves should not be re-used or washed. Gloves contaminated with an infectious agent should be disposed of by appropriate procedures. General- purpose utility gloves should be used for housekeeping chores. For individuals allergic to latex gloves, nitrile or vinyl gloves are recommended.

Safety glasses/safety goggles/safety face shields

Eye and face protection equipment selection is based upon chemical hazard type and material compatibility considerations with regard to chemical(s) of interest. Everyone must wear eye protection at all times while in the lab, except when actively using optical microscopes. Eye protection should conform to the Standard for Occupational and Educational Eye and Face Protection, Z87.1, established by the American National Standards Institute (ANSI).

a. Safety Glasses

Safety glasses protect the eyes against flying objects and direct splashes. Safety glasses are the minimum acceptable eye protection, and should be made of impact-resistant hardened glass or plastic. Many safety glasses have side shields molded into or attached onto the earpieces. Side shields on safety glasses provide some peripheral protection, but cannot provide adequate shielding from all flying debris and chemical splashes. Other eye protection should be worn when significant hazard exists.

b. Safety Goggles

Safety goggles provide protection for the eye from flying objects or splashing chemicals. To prevent lenses from fogging, impact-protection goggles have screened areas on the sides to provide ventilation. However, these do not provide full shielding from chemical splashes. When full protection from harmful chemical splash is needed, splash goggles or "acid goggles" should be worn.

c. Safety Shields

Portable shields should be non-combustible. They can be made of laminated safety glass or polymeric materials such as polycarbonate or methacrylate. When used on the laboratory bench, safety shields should surround the hazard, with minimum openings to allow maneuvering of apparatus inside. Like safety glasses and goggles, safety shields should be cleaned and inspected frequently. Cracked or pitted safety shields should be replaced. The most common example of a safety shield is the window of a laboratory fume hood. Portable safety shields can also be used on the laboratory counter top

Clothing

Laboratory aprons should always be worn when working with hazardous chemicals. These garments should be replaced if they become perforated or torn. A laboratory apron can provide protection against contact with dirt and minor chemical splashes or spills. It also provides protection for the user's clothing.

Shoes

Work shoes of a specialized nature are not required. However, open-toed or cloth shoes are unacceptable in the laboratory. While leather shoes offer protection in case of spills, leather readily absorbs organic liquids.

Respirators

Under ordinary conditions, respirators should not be necessary in the laboratory. Respirators may not be used under any circumstances unless approved by MSU Safety and Risk Management and the wearer is in MSU's medical surveillance program. This program includes a medical evaluation and clearance, fit testing and training. If a respirator is thought to be needed, please call SRM and request a hazard assessment to determine if one is required.

ARM/OSHA policy dictates that engineering and work practice controls be used to reduce employee exposure below the Permissible Exposure Limit, or PEL. Respiratory protection is to be used only as an interim measure or when engineering or work practice controls are infeasible. Use of respiratory equipment must comply with the requirements of ARM 24.30.102(5)1910.134, which specifies factors such as selection, fit, use, and maintenance.

FUME HOODS AND OTHER PROTECTIVE EQUIPMENT

Fume hoods and other protective equipment must function properly at all times. Specific measures are taken to ensure proper and adequate performance of such equipment as detailed below.

Lab fume hood face velocities are measured by Facilities Services personnel at programmed intervals with non-attainment hoods being documented and identified for repair.

Ensuring adequate hood performance is a complex issue and includes many factors including:

1. Operation of the building's ventilation system.
2. Procedures and work practices including:
    a. Position and movement of the user,
    b. Contaminant generation characteristics,
    c. Contaminant generation location,
    d. Location of obstructions, and
    e. Sash position and configuration.
3. Laboratory designs, including:
    a. potential for interfering cross drafts,
    b. location of all hoods in the lab,
    c. proximity of air supply diffusers, and
    d. proximity to doors and traffic aisles.

With particularly hazardous chemicals or wastes, operations such as unpacking, diluting, packing, or reacting hazardous materials should be performed in the fume hood. Weighing operations involving particularly hazardous substances should be performed in a glovebox.

Types of Protective Equipment/Specific Measures to Ensure Proper and Adequate Performance

Safety and emergency equipment includes fire extinguishers, eyewash fountains, safety showers, laboratory hoods, laboratory sinks, first-aid kits and spill kits.

a. Eye wash Fountains

An eyewash fountain should be capable of providing a gentle stream or spray of aerated water for an extended period of time, usually fifteen minutes, although 30 minutes may be required. The minimum flow rate should be at least 1.5 liters per minute for 15 minutes.

The eyewash should be located as close to the safety shower as possible, so that the eyes may be rinsed while the body is being showered. Plumbed eyewash units must be activated weekly to flush the line and to verify proper operation. Laboratories with plumbed eyewash units should assign someone to provide weekly flowing of the eyewash unit(s).

b. Safety Showers

Safety showers are for immediate first-aid treatment of personnel contaminated with hazardous materials, and for extinguishing clothing fires. Every laboratory worker should be familiar with the location and proper operation of safety showers. MSU Facilities Services is responsible for periodic flowing and maintenance of Safety Showers. Each shower must be activated monthly (where drains are installed) to flush the line and to verify proper operation. Laboratory occupants should examine the certification card to ensure they have been tested in the last 30 days. The shower should be equipped with a quick-opening valve that can remain open without being held but requires manual closing since the minimum recommended time of operation is 15 minutes.

The American National Standards Institute (ANSI) Z358.1-2004 is a voluntary standard that provides minimum requirements for the performance, use, installation, test procedures, maintenance and training of emergency eyewash and shower equipment. This ANSI standard does not state when a shower/ eyewash is required this is specified in the ARM/OSHA rules, but provides the detailed installation and maintenance requirements to be followed, if one is required.

c. Laboratory Sinks

The laboratory sink is essential for safety in the laboratory. Employees must rinse and dry the chemical gloves with DI water before removal or when they come in contact with hazardous substances. The sink is also used for washing equipment that comes in contact with hazardous materials. Any problems with water supply or drainage of laboratory sinks should be reported to MSU Facilities Services.

d. First Aid Kits

A first aid kit should be clearly marked and available to all laboratory workers. The kit should be inspected periodically and the contents replenished as needed. An attached tag or sticker can serve as documentation of inspection.

e. Spill Clean-up Kits (Suggested Items)
    - Safety goggles and lab coat
    - Heavy gloves appropriate for the materials
    - 5 gallon plastic bucket
    - Small bag of absorbent (kitty litter)
    - Acid/Base neutralization materials Acid spill - sodium bicarbonate Base spill -monosodium phosphate
    - Solvent adsorbent
    - Formaldehyde Solidifier
    - Spill pads
    - Absorbent socks/booms
    - Dustpan
    - Garbage bags
    - Spill response instructions

EMPLOYEE INFORMATION AND TRAINING

MSU provides all employees affected by ARM 24.30.102(5)1910.1450 with information pertaining to safely working with hazardous chemicals and how to protect themselves. This section outlines the training and information.

Training is to be conducted under the following circumstances:
• Prior to initial assignment for all employees new to the lab.
• At annual intervals thereafter.
• Whenever a new process, reaction or chemical of interest is introduced into the laboratory.

Training is to be provided by the CHO (lab manager, PI, or other qualified individual) or by SRM classroom training. SRM also provides online lab safety training courses at no cost to employees. All training activities must be documented and kept on file.

At a minimum, the training discussion topics must include the following at time of initial assignment and annually thereafter:
• The existence of the CHP and requirements of the laboratory standard.
• The location and availability of the CHP.
• Permissible exposure limits for regulated substances and recommended exposure limits for other hazardous chemicals where no OSHA standard applies.
• Signs and symptoms associated with exposures to hazardous chemicals.
• Location and availability of known reference materials, including SDS, safe handling, storage, and disposal of hazardous chemicals in the workplace.

Upon initial assignment and/or new exposure situations at this facility, it is the responsibility of the Lab Manager, PI, or other designated individual to ensure:
- Employees are apprised of the specific hazardous chemicals present in their work area.
- Employees are informed of the specific measures of protection from hazards within their work area.
- Employees are trained on the applicable details of the written CHP.

PRIOR APPROVAL CIRCUMSTANCES

Certain laboratory operations, procedures, or activities require prior approval from the Chemical Hygiene Officer before they may be performed. At this facility, specific operations, procedures and activities requiring prior approval of the Chemical Hygiene Officer; whom is the PI, Lab Manager or other designated responsible personnel are:

1. **Operations requiring one-time prior approval**
    a. **General pouring, use, and disposal of acids, bases, oxidizers, and solvents.**
    b. **Pouring, using, and disposing of piranha, a mixture of sulfuric acid and hydrogen peroxide.**
    c. **Pouring, using, and disposing of hydrofluoric acid and hydrofluoric acid-containing mixtures such as buffered oxide etch.**
2. **Operations requiring prior approval every time**
    a. **Pouring, using, and disposing of concentrated tetramethylammoniumhydroxide.**
    b. **Operation or maintenance of any semiconductor process equipment, e.g. furnaces, exposure systems, deposition systems, and etching systems.**

MEDICAL CONSULTATION AND MEDICAL EXAMINATIONS

Medical consultation and examinations are the employees right in certain circumstances. MSU is committed to providing for such medical care for all employees affected by this CHP.

All individuals who work with hazardous chemicals should have the opportunity to receive medical surveillance, including follow-up exams, under the following circumstances:

a. When an individual develops signs or symptoms associated with a hazardous chemical they may have been exposed to, they should receive an appropriate medical exam.
b. When exposure monitoring reveals exposure level to be above the ARM/OSHA action level or PEL for which there are exposure monitoring and medical surveillance requirements, medical surveillance should be established as prescribed by the standard.
c. When an event such as a spill, leak, or explosion occurs resulting in the likelihood of a hazardous exposure, medical consultation should be provided to determine the need for a medical examination.

All medical exams and consultations must be performed by or under the direct supervision of a licensed healthcare provider and will be provided without cost to the exposed individual, and at a reasonable time and place. The laboratory should provide the following information to the healthcare provider:

a. The identity of the hazardous chemical(s) to which the individual may have been exposed;
b. Description of the conditions under which the exposure occurred including quantitative exposure, if available; and
c. Description of the signs and symptoms of exposure that the individual is experiencing if any, and;
d. Copies of SDSs for the hazardous chemical(s). MSU's online SDS database provider can be utilized for this purpose and accessed through the SRM website: https://montana.bioraft.com/

SRM must obtain a written opinion from the healthcare provider performing the examination or consultation, which must include the following:

a. Any recommendation for further medical follow-up.
b. The results of the medical examination and any associated tests.
c. Any medical conditions which may be revealed in the course of examination which may place the individual at increased risk as a result of exposure to a hazardous chemical found in the laboratory; and
d. Statement that the exposed individual has been informed by the healthcare provider of the results of the consultation or examination and any medical condition that may require further examination or treatment. The written opinion should not reveal specific findings of diagnoses unrelated to occupational exposure.

Any employee who is exposed routinely above the ARM/OSHA action level or, in the absence of an action level, above the PEL for an ARM/OSHA regulated substance for which there exists exposure monitoring or medical surveillance requirements, has the opportunity for medical attention and evaluation. Employees are required to immediately notify the supervisor if they reasonably feel that a chemical exposure has occurred, or is likely to occur. In consultation with the MSU Occupational Health Manager the employee will seek immediate medical screening and evaluation. Prior to any return to work, the work environment will be evaluated by the Occupational Health Manager and the Hazardous Materials Officer to determine how exposure

to hazardous substances might have occurred and will take immediate action to mitigate exposure potential in the work environment.

MSU establishes and maintains for each employee an accurate record of exposure monitoring results and any medical consultation and examinations, including tests or physician medical opinions, in accordance with the ARM/OSHA rule governing access to employee exposure and medical records, ARM 24.30.102(5)1910.1020 according to the following method: Exposure monitoring results and corresponding medical consultation information associated with potential hazardous material exposures are maintained by MSU Safety and Risk Management. Records are kept in SRM for the length of the employee's employment at MSU, plus thirty years.

Any known or suspected workplace exposure incidents, or any illness of questionable origin, must be reported immediately to the supervisor. Seek medical attention at Montana Occupational Health at (406) 556-1900 from 9am to 5pm Monday through Friday, or the Bozeman Deaconess Hospital Emergency Room (406) 585-1000 24 hours a day.

As soon as possible following an exposure incident, and within 24hrs, the employee and supervisor must complete a First Report of Injury or Occupational Disease form, to begin the worker's compensation process. This form is available at: https://firstreportinjury.mus.edu/
A follow-up investigation may be initiated by SRM staff to determine the circumstances of the event, and examine potential options to prevent future occurrences.

DESIGNATION OF RESPONSIBLE PERSONNEL

The Chemical Hygiene Officer serves a very important function regarding this plan. This person is someone qualified by training or experience to provide technical guidance in the development and implementation of the provisions of the CHP required by the ARM/OSHA Laboratory Standard.

At this facility, the Chemical Hygiene Officer is: Dr. Andrew Lingley, Manager and Research Engineer.

EMPLOYEE PROTECTION PROVISIONS FOR PARTICULARLY HAZARDOUS SUBSTANCES

This laboratory at times conducts work involving select carcinogens, reproductive toxins, and/or substances having a high degree of acute toxicity. To protect employees when working in these especially hazardous situations, there are special provisions in place for these situations, including designated work areas, special containment devices in those work areas, decontamination procedures, waste removal procedures, and operating procedures.

The area of the laboratory designated and posted as an area for work involving select carcinogens, reproductive toxins, or substances having a high degree of acute toxicity, is limited to the following:

- Fume hoods in Cobleigh 523
- Fume hoods in Cobleigh 525
- Fume hoods in Cobleigh 525A
- Fume hoods in Barnard 107

The types of fume hood or equivalent containment device in use in the designated areas are negative pressure chemical fume hoods.

The decontamination procedures to be followed in the designated areas involve:

- Rinsing and drying chemical gloves before removal.
- Rinsing and drying all wet bench surfaces, with waste going to the neutralization system.
- Checking all other PPE for damage or contamination after use, and then rinsing, drying and disposing if contaminated.

Contaminated waste is disposed of into a secure receptacle in the laboratory and subsequently removed by MSU Hazardous Materials Management personnel.

Working with Allergens and Embryotoxins (e.g 1-methyl-2-pyrrolidinone)

- Wear suitable gloves to prevent hand contact with allergens or substances of unknown allergenic activity.
- Women of childbearing age are to handle these substances only in a hood whose satisfactory performance has been confirmed, using appropriate Personal Protective Equipment, PPE, to prevent inhalation and skin contact.
- Review each use of these materials with the supervisor/CHO and review continuing uses annually or whenever a procedural change is made.
- Store these substances, properly labeled, in an adequately ventilated area in an unbreakable secondary container.
- Notify supervisors and/or the CHO of all incidents of exposure or spills.

Work with Chemicals of Moderate Chronic or High Acute Toxicity (e.g. hydrofluoric acid and concentrated tetramethyl ammonium hydroxide)

Supplemental rules to be followed in addition to those mentioned for allergens and embryotoxins.

1. Use and store these substances only in areas of restricted access with special warning signs.
2. Always use a fume hood (previously evaluated to confirm adequate performance with a face velocity of at least 60 linear feet per minute) or other containment device for procedures which may result in the generation of aerosols or vapors containing the substance; trap release vapors to prevent their discharge with the hood exhaust.
3. Personal protection: Always avoid skin contact by use of gloves and long sleeves (and other protective apparel as appropriate). Always wash hands and arms immediately after leaving the cleanroom when working with these materials.
4. Maintain records of the amounts of these materials on hand, amounts used, and the names of the workers involved.
5. Prevention of spills and accidents: Be prepared for accidents and spills. Assure that at least 2 people are present at all times if a compound in use is highly toxic or of unknown toxicity.
6. Store breakable containers of these substances in chemically resistant trays; also work and mount apparatus above such trays or cover work and storage surfaces with removable, absorbent, plastic backed paper.

7. If a major spill occurs outside the hood, evacuate the area; assure that cleanup personnel wear suitable protective apparel and equipment.
8. Thoroughly decontaminate or incinerate contaminated clothing or shoes. If possible, chemically decontaminate by chemical conversion.
9. Store contaminated waste in closed, suitably labeled, impervious containers (for liquids, in glass or plastic bottles half-filled with vermiculite.

Work with Chemicals of High Chronic Toxicity

Further supplemental rules to be followed, in addition to all those mentioned above, for work with substances of known high chronic toxicity (in quantities above a few milligrams to a few grams, depending on the substance).

1. Conduct all transfers and work with these substances in a controlled area: a restricted access hood, glove box, or portion of a lab, designated for use of highly toxic substances, for which all people with access are aware of the substances being used and necessary precautions.
2. Prepare a plan for use and disposal of these materials and obtain the approval of the laboratory supervisor/CHO.
3. Protect vacuum pumps against contamination by scrubbers or HEPA filters and vent them into the hood. Decontaminate vacuum pumps or other contaminated equipment, including glassware, in the hood before removing them from the controlled area. Decontaminate the controlled area before normal work is resumed there.
4. Upon leaving a controlled area, remove any protective apparel (placing it in an appropriate, labeled container) and thoroughly wash hands, forearms, face, and neck.
5. Use a wet mop or a vacuum cleaner equipped with a HEPA filter instead of dry sweeping if the toxic substance was a dry powder.
6. If using toxicologically significant quantities of such a substance on a regular basis (e.g., 3 times per week), consult a qualified physician concerning desirability of regular medical surveillance.
7. Keep accurate records of the amounts of these substances stored and used, the dates of use, and names of users.
8. Assure that the controlled area is conspicuously marked with warning and restricted access signs and that all containers of these substances are appropriately labeled with identity and warning labels.
9. Assure that contingency plans, equipment, and materials to minimize exposures of people and property in case of accident are available.
10. Storage: Store containers of these chemicals only in a ventilated, limited access area in appropriately labeled, unbreakable, chemically resistant, secondary containers.
11. There are two types of glove boxes:
    A. Negative Pressure: Negative pressure glove boxes are designed to allow a person to work with hazardous substances, such as radioactive materials, highly toxic substances or infectious disease agents. This negative pressure glove box is generally maintained at a lower pressure than the surrounding atmosphere. Microscopic leaks would allow air to flow inward rather than allowing the hazard to flow out. For a negative pressure glove box, the ventilation rate must be at least 2 volume changes per hour and pressure at least 0.5 inches of water.
    B. Positive Pressure: A positive pressure glove box is used for handling air- and/or water-reactive materials (e.g. organometallics in Chemistry or lithium metal in Metallurgy.) The positive pressure glove box is designed to contain a high purity inert

atmosphere (e.g. argon or nitrogen). Inert atmosphere glove boxes are usually kept at a pressure slightly higher than the surrounding air, so that any small leaks would be inert gas leaking outward instead of air leaking inward. For a positive pressure glove box, thoroughly check for leaks before each use. In either case, trap the exit gases or filter them through a HEPA filter and then release them into the hood.

12. For chemicals of high chronic toxicity, use chemical decontamination whenever possible; ensure that containers of contaminated waste (including washings from contaminated flasks) are transferred from the controlled area in a secondary container under the supervision of authorized personnel.

Revision History

2020.1 – Clarified prior approval section. These situations require either one time prior approval or prior approval for every time.
2020.2 – Included Cobleigh 421 as a room covered by this document.
2021.1 – Cleaned up comments.

Name (Print)	Date CHP Read	Signature
Users' signatures are kept online		
